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EXAMINER	
TORRES, JOSE	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/697,358	Applicant(s) WANG ET AL.	
	Examiner José M. Torres	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 August 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-21 and 23-40 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15,16,18,20,35,36,38 and 40 is/are allowed.
- 6) ☒ Claim(s) 1,4-14,17,19,21,24-34,37 and 39 is/are rejected.
- 7) ☒ Claim(s) 3 and 23 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Comments

1. The Amendment filed on August 6, 2007 has been entered and made of record.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 4-11, 21 and 24-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhu et al. (U.S. Pat. No. 6,424,749) in view of

As to claims 1 and 21, Zhu et al. teaches a method/system of interpolating image positions in an original image to produce an interpolated output image, wherein the original image is represented by digital input pixel data ("Format Conversion", Col. 1 lines 6-9), comprising the steps of: (a) providing a first filter having a sharp interpolation characteristic (FIG. 8, "Interpolator **800**", Col. 7 lines 33-39); (b) providing a second filter having a smooth interpolation characteristic (FIG. 8, "Scaler **810**", Col. 7 lines 40-45); (c) interpolating a selected image position in the image using the first filter to generate a sharp interpolation output value (Output of Interpolator **800**); (d) interpolating a selected image position in the image using the second filter to generate a smooth interpolation output value (Output of Scaler **810**). The characteristics of both filters are disclosed in

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Col. 4 line 22 through Col. 5 line 30, and the embodiment of FIG. 8 is disclosed in Col. 7 line 22 through Col. 9 line 14, in which both filters are used.).

Hrytzak et al. teaches selectively combining/combiner the output values from the filters (Sharp and Smooth interpolated values X and Y , Col. 5 lines 32-49) as a function of the weighting coefficients (" S , $(1 - S)$ "), to generate an interpolation output value ("Interpolated Output Pixel P ") for the selected image position of an interpolated output image (FIG. 3, "DSP Controller 18") Col. 4 line 15 through Col. 5 line 49).

However, the calculation of a different weighting coefficient for the output of each filter by estimating a high frequency level at the interpolated selected image position and calculating the weighting coefficients based on the estimated image high frequency level are not explicitly disclosed by Zhu et al. neither Hrytzak et al.

Zhu et al. disclose a weighting coefficient used to scale the output of the sharp interpolation filter 800 being based on the extracted edge information obtained using a 2-D Marr high pass filter (Col. 7 lines 46-67), in order to reduce ringing. In addition in at least Col. 2 lines 12-24, Col. 7 lines 17-21, Col. 17 lines 44-63 and Col. 18 lines 22-40, it is disclosed that the interpolators are programmed to have complementary frequency response. Therefore, it is appreciated by one of ordinary skill in the art at the time the invention was made that a weighting coefficient used to scale the output of an interpolation filter can be based on the high frequency component of the interpolated image.

Hrytzak et al. disclose the weighting coefficients ("S, (1 - S)") being based on image contrast and density (Col. 5 lines 32-38). The image contrast derived takes into consideration the image content, therefore, if the image contains edges the high frequency level is inherently used (Col. 5 lines 3-23). However, the scale factor S is not calculated for the interpolated image position as claimed. It is also disclosed that the manner in which S is derived is application dependent and is ideally also user controllable (Col. 5 lines 50-68).

Therefore, in view of Hrytzak et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Zhu et al.'s method and system by incorporating the method steps of using a different weighting coefficient, in which one of the coefficient is the complementary of the other, and selectively combining the output from the filters as a function of the weighting coefficients to generate an interpolation output value, as taught by Hrytzak et al., and the coefficient being based on the high frequency level at the interpolated selected image position, as taught by Zhu et al., in order to allow control of the degree of sharpness and softness in the interpolated outputs based upon local image content (Col. 9 lines 43-45).

As to claims 4 and 24, Zhu et al. does not explicitly disclose wherein the interpolation output value q for the selected image position is according to the relation: $q = r \cdot \alpha + s \cdot (1 - \alpha)$ wherein α and $(1 - \alpha)$ are the weighting coefficients for the first and

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second filters, respectively ($0 \leq \alpha \leq 1$), and r and s are the filter output values from the first and second filters respectively.

Hrytzak et al. further teaches wherein the interpolation output value q ("Interpolated Output Pixel P") for the selected image position is according to the relation: $q = r\alpha + s(1 - \alpha)$ (" $P = SX + (1 - S)Y$ ") wherein α ("S") and $(1 - \alpha)$ ("1-S") are the weighting coefficients for the first and second filters, respectively ($0 \leq \alpha \leq 1$), and r ("X") and s ("Y") are the filter output values from the first and second filters respectively (It can be shown that the equation used in Hrytzak et al. to calculate the interpolated pixel value is carried out in the same fashion wherein the weighting coefficients (S and (1-S)) are used for the output of the filters. Col. 5 lines 39-49).

As to claims 5 and 25, Zhu et al. further teaches the first filter comprises a polyphase filter; and the second filter comprises a polyphase filter (It is disclosed that the interpolator **800** and scaler **810** are both 2-pass 1-D scalers. Also in Col. 4 line 22 through Col. 5 line 67 a detailed explanation of the polyphase filters used is disclosed. Col. 7 lines 33-45).

As to claims 6 and 26, Zhu et al. further teaches the first filter comprises a one dimensional FIR polyphase filter; and the second filter comprises a one dimensional FIR polyphase filter (Col. 4 line 22 through Col. 5 line 67).

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As to claims 7 and 27, Zhu et al. further teaches wherein the two polyphase filters have the same length (Tables 3, 4, and 5 shows filter information for the interpolator, the scaler and the edge extractor using 128 phases, therefore, the same length for each one. Col. 8 lines 15-27).

As to claims 8 and 28, Zhu et al. further teaches wherein each of the polyphase filters comprises a N -tap M -phase polyphase filter (16-tap 128 phase filter, Col. 6 lines 1-9).

As to claims 9 and 29, Zhu et al. further teaches wherein for arbitrary or variable interpolation ratios, M has a value of 10 or larger (65 or 128, Col. 6 lines 1-9 and Col. 8 lines 15-27).

As to claims 10 and 30, Zhu et al. further teaches wherein N can be either an odd or an even number value (Table 2 shows the kernel sizes, Col. 6 lines 34-59).

As to claims 11 and 31, Zhu et al. further teaches wherein the two filters are low-pass filters, such that the first filter has a sharp frequency transition band and the second filter has a smooth frequency transition band (FIGs. 2b and 3b shows the frequency response to the interpolators used, Col. 4 lines 51-64 and Col. 5 lines 25-30).

4. Claims 12-14 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhu et al. in view of Hrytzak et al. as applied to claims 1 and 21 above, and further in view of Kim (U.S. 2002/0067862). The teachings of Zhu et al. modified by Hrytzak et al. have been discussed above.

As to claims 12 and 32, Zhu et al. modified by Hrytzak et al. fails to teach calculating the weighting coefficient for each of the two filters further includes the steps of: estimating the image high frequency level at the selected image position, and calculating a weighting coefficient for the output of the filter based on the estimated image high frequency level; and the image high frequency level at the selected image position is estimated based on the image high frequency components measured at original image pixels neighboring the selected image position.

As to claim 12, Kim further teaches calculating the weighting coefficient for each of the two filters further includes the steps of: estimating the image high frequency level at the selected image position (" $h(m,n)$ "), and calculating a weighting coefficient for the output of the filter based on the estimated image high frequency level (Enhancement value $a \cdot h(m,n)$); and the image high frequency level at the selected image position is estimated based on the image high frequency components measured at original image pixels neighboring the selected image position (" $n-1 \dots n+1$ ", Paragraphs [0030]-[0034]).

Therefore, in view of Kim, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Zhu et al. and Hrytzak et al. by incorporating the method steps and the high pass filter, as taught by Kim, to

estimated the high frequency level at the selected position based on components measured at original image pixels neighboring the selected image position in order to suppress or prevent Shoots (Paragraph [0034]).

As to claims 13 and 33, Kim further teaches the image high frequency component at the original image pixels is measured using high-pass filtering process ("high-pass filter", Paragraph [0030]).

As to claims 14 and 34, Kim further teaches the image high frequency component at the original image pixels is measured using a high-pass FIR filter (The high-pass filter described in Paragraphs [0030]-[0034] comprises a finite impulse response filter).

As to claims 17 and 37, Kim further teaches the image high frequency level at the selected image position is estimated based on the image high frequency components calculated at two original image pixels closest to the selected image position (Horizontal or vertical pixels taken into account. Paragraphs [0030]-[0031]).

As to claims 19 and 39, Kim further teaches the image high frequency level at the selected image position is estimated based on the image high frequency component measured at original image pixels that are within the filtering range of interpolation to the selected image position (The values used to calculate the high frequency level

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correspond to those which are within the range of enhancement. Therefore if these high frequency values are used for the interpolation process taught by Hrytzak et al. it would correspond to the interpolation range. Paragraphs [0010] and [0030]-[0034]).

Allowable Subject Matter

5. Claims 3 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 15, 16, 18, 20, 35, 36, 38 and 40 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: The closest prior art made of record fails to disclose or suggest calculating the weighting coefficients for the output of the filters based on the high frequency level at the selected image position, wherein the image high frequency component is measured according to the relations presented in the current application.

Response to Arguments

Claim Rejections under 35 U.S.C. § 112

6. Claims 35, 38, and 40 have been amended to correct antecedent basis for the claimed limitations. Therefore, the rejections (Claims 35, 36, 38 and 40) have been removed.

Claim Rejections under 35 U.S.C. § 103

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7. Applicant's arguments with respect to claims 1, 4-14, 17, 19, 21, 25-34, 37 and 39 have been considered but are moot in view of the new ground(s) of rejection.

Now amended claims 1 and 21 raised new issues because the amendment made to recite "estimating a high frequency level at the interpolated selected image position" specifies that the high frequency level is measured once the image is interpolated. Previously, "the selected image position" was interpreted as being the position of the original image to be interpolated, therefore, the high frequency level component was measured before the interpolation.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yoshikawa disclose Resizing Images Captured by an Electronic Still Camera, and Glotzbach et al. disclose a Digital Still Camera Color Filter Array Interpolation System and Method.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José M. Torres whose telephone number is 571-270-1356. The examiner can normally be reached on Monday thru Friday: 8:00am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on 571-272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMT
10/11/2007


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